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HDR
Task 6406

Simplot Data Recovery Research Design, 42UN8049 and 42UN8053

Introduction

Simplot Phosphates, LLC (Simplot) contracted HDR to conduct a cultural resources field reconnaissance (Class II Inventory) of a 666.5-acre area on the west end of its Vernal Phosphate Mine east parcel in 2014. The cultural resources survey was conducted as part of Simplot's application with the Utah Department of Natural Resources' Division of Oil, Gas, and Mining for its mine expansion plan. A portion of the survey overlapped a cultural resources inventory conducted by Desert West Environmental (DWE) in 2012 (Hutmatcher Cunningham 2013). The two surveys cover the areas for a 10-year mine expansion proposed by Simplot. The proposed mine expansion and survey areas are on private land.

Two prehistoric archaeological sites previously recorded by DWE in or near the HDR survey area (42UN8049 and 42UN8053) were recommended eligible to the National Register of Historic Places (NRHP). The proposed mitigation effort includes data recovery of a portion of each site and strategic sampling of other areas in order to gain a more comprehensive understanding of the resources.

This document presents the research design for the mitigation of 42UN8049 and 42UN8053. A review of regional archaeological literature and the sites' geological context is presented to develop research questions for the data recovery and sampling. Additionally, this document describes the proposed data recovery procedures, sampling methodology, and data analysis methods.

42UN8049 and 42UN8053 are located within approximately 400 meters of one another. Site 42UN8049 is a large lithic scatter with an area of 55,674 square meters (m^2) (13.8 acres). It is located in an area where Tertiary Bishop conglomerate deposits are exposed on the ground surface. The site has been characterized as a quarry because of the large surface artifact assemblage, which consists of thousands of pieces of debitage from all stages of reduction, tested cobbles, and expedient tools. DWE said some of the assemblage may represent natural fracture, not human activity. Site 42UN8053 is a 26 m^2 (0.01 acres) site with a partially exposed fire cracked rock feature and two cryptocrystaline silicate flakes. No chronologically diagnostic

artifacts have been observed at either of the sites, and their chronological relationship is unknown. When recording the sites, DWE estimated sediments to be 15 to 20 centimeters (cm) (6 to 8 inches) deep, sufficient to potentially contain subsurface cultural deposits. Given that prehistoric quarries and fire cracked rock concentrations are rarely encountered in the region, 42UN8049 and 42UN8053 provide an opportunity to ask important research questions about site formation processes and about the relationship between the quarry and local prehistoric foraging activities.

Uintah Basin Environment and Geology

This section of the research design will briefly review literature from the Great Basin with a focus on the Uintah Basin. The goal of this section is to discuss the types of sites and artifacts reported at sites near the project area, discuss the general environment of the project area, and the context and deposition of geological materials used by people in the past. This information will be used to formulate the research questions that will be addressed as part of the data recovery at 42UN8049 and 42UN8053.

Great Basin prehistory provides a compelling look at life in a desert environment through time. In broad terms, the region's prehistory has been divided into four periods: Paleoindian [circa (ca.) 12000 to 9000 years before present (BP)[; Archaic (ca. 9000 to 1600 BP); Formative (ca. 1600-650 BP); and Late Prehistoric/Protohistoric (ca. 650 BP to contact). The periods are distinguished archaeologically by specific artifact types, particularly projectile point types, by the appearance of pottery late in prehistory, and by broad changes in landscape use and settlement patterns. What most of prehistoric peoples of the Great Basin share is a focus on seasonal hunting and gathering patterns, which involved the exploitation of different plant and animal food resources at different elevations over different times of the year.

Investigations of the prehistory of the Great Basin have focused on changes in the use of local environments and changes in diet breadth to determine the implications of those changes for settlement patterns and the selective utilization of plants and animals. In regard to this project, these ideas will be used to ask questions of the archaeological materials at the two sites being investigated.

Sites 42UN8049 and 42UN8053 are located within the Uintah Basin at the northeastern edge of Great Basin environments and cultures. The climatic pattern of warm, dry summers and cool, wet winters throughout the Holocene contributed to a lifestyle of seasonal hunting and gathering and a high degree of mobility throughout much of prehistory.

A great deal of research focusing on subsistence has been conducted in the Great Basin (Barlow 2002; Bayham et al. 2011; Bowen 2006; Broughton et al. 2011; Broughton and Grayson 2011; Byers et al. 2004; Byers and Broughton 2004; Byers et al. 2005; Carpenter 2000; Grayson 1977; Grayson 1993; Grayson 2000; Grayson and Cannon 1999; Zeenah 2004). Research that has focused on subsistence near the Uintah Basin includes Day's (1964) discussion of Thorne Cave, the Byers et al. (2004) discussion of artiodactyl populations in the Holocene, and Lupo and Schmidt's discussion of bison hunting during the Holocene in eastern Utah. Byers et al. (2004) discuss the paleoenvironment of southwestern Wyoming and focus particularly on the variation of precipitation in the region and its effects on artiodactyl populations. In their study of

the recent archaeological materials that have been excavated from areas where oil and gas fields are being constructed, they compared them with the archaofaunal record from the region, a noted increase in artiodactyl densities is notable during the late Holocene in the Wyoming Basin. Lupo and Schmidt (1997) discussed the availability of bison in the late Holocene and find that the variability in bison fluctuated and may have contributed to flexibility in Freemont subsistence strategies in northeastern Utah.

The Uintah Basin is bounded by the Wasatch Mountains along the west, the Uintah range on the north, the Rocky Mountain range on the east, and the Book Cliffs on the south. The Green River is the major tributary that runs through the region and it flows through Flaming Gorge fault south to the Colorado River (Day 1964). Geologically, the Uinta Basin, as with many basins in the Great Basin, fluctuated between being a lacustrine lake environment and a saline lake environment during the Cretaceous and Tertiary periods. Carroll and Bohacs (2001) note three lacustrine facies that contribute to the petroleum sources in the Uintah Basin: fluvial deposits that contributed to the development of mudstone; basin fills that raised the grade of the stream beds (aggredational processes) and valleys and were also subject to processes that spread the fill over the basin (pregradational processes); and aggraded non-marine fill deposits that desiccated during times when the environment was more saline.

The Uinta Mountains are formed of sedimentary rock that uplifted during the Cretaceous period and contain large faults. The red and purple quartzite and sandstone beds aggregate more than 12,000 feet in thickness and form the mass of the mountain range. During the Tertiary the Green River filled with sediment up to thousands of feet; a phenomenon mentioned in the report of Thorne Cave and its depositional history of Cliff Creek (Day 1964).

Bishop conglomerate is noted to be the dominate formation exposed at the site locations and is thought to be the primary source of tool stone at the project area. When recording the two sites, DWE described the clasts at 42UN8049 as including chert and chalcedony cobbles mostly in the 5 to 10 cm (2 to 4 inch) diameter range, making them large enough to serve as raw material for stone tool manufacture. The depositional date of the conglomerate is unknown, but it is found mostly to "mantle the highest flat-topped inter-stream divides" in the Uintah Basin, such as the landform where 42UN8049 and 42UN8053 are located. Both sites are on a narrow ridge on which sediments are subject to alluvial erosion and redeposition into the adjacent Cottonwood and Buckhorn canyons.

Research conducted by Dehler et al. (2005) on ash layers within the Uinta Basin agree that the depositional history of Bishop conglomerate is poorly understood, in part because of its lack of exposure and in part because of inadequate study. They note that the Starr Flat member of the Duchesne River may be a facies of the Bishop conglomerate and ash lenses date to 30 to 37 million years ago, and suggest a deposition date for the conglomerate.

The deposition of Bishop conglomerate is thought to have occurred during a moist climatic period in the late Miocene or early Pliocene and was deposited during an uplifting even in the Uinta Mountains (Baker, Dane, and Reeside, Jr. 1936: 167- 168). Bishop conglomerate is described as poorly sorted veneer overlying the Brown's Park formation, and is one that doesn't conceal the shape of the underlying landforms however the erosion of the conglomerate does conceal the surfaces of some landforms (Baker, Dane, and Reeside, Jr. 1936: 171-172).

The conglomerate is described as "reddish brown boulders derived from the Uintah Mountain group" and is composed of red quartzite, white quartzite, red sandstone, white quartz and hornblende schists, limestone with a chert-like quality, and black and red chert. The combination of stone types varies by location and consists of gravels, pebbles, cobbles, and boulders laid in a medium to coarse-grained sand matrix. Below the timberline the conglomerate is covered by a light coating of sandy soil. Above the timberline there is greater solid deposition over the conglomerate (Baker, Dane, and Reeside, Jr. 1936: 172-173).

Given the basin's unique geographic location; Great Basin, Plains, Fremont, and Puebloan cultures influenced the region (Aikens 1964; Day 1964). One of the oldest known sites in the Uintah Basin is Thorne Cave which is located on an ephemeral tributary of the Green River named Cliff Creek. Cultural deposits noted at the cave included animal bone (deer, cottontail, pronghorn, and beaver), charcoal, concentrations of ash, fire cracked rock, manos (complete and fragmented), a grinding stone, quartz flakes and other stone tool material, a bone awl, a bone needle, a bone pendant, a scapula saw/scraper (similar to one found at Lovelock Cave), baked clay objects, a lanceolate projectile point and a lanceolate blade, six stemmed projectile points, scrapers (of both stone and bone), and an imprint of a twine basket left in the clay floor of the cave (Day1964: 52-53).

The accumulation of artifacts lacked provenience due to water and the deposition of soils within the cave after it was used, however the assemblage indicates tools and materials commonly associated with the Archaic period in the Great Basin and compares with other caves and sites in the Great Basin that do have more well preserved and datable deposits (Hells Midden [Lister 1951], Humbolt Cave [Heizer and Krieger 1956], Love Lock Cave [Loud and Harrington 1965], the Karlo Site [Riddell 1960]). Radiocarbon samples taken from the site date the charcoal to around 2000 BC (4230-4170 B.P.). Day (1964: 59) notes that some of the artifacts may have been of a high plains influence, suggesting that more than Great Basin culture groups may have used the cave.

The seven projectile points (complete and partial) recovered at Thorne cave ranged in length from 5.5 to 3.2 cm and were made out of cryptocrystalline silicate materials (agate, chert, and chalcedony) of various colors. All of the points showed retouch and some had secondary flake removal (Day 1964: 54-55)

The faunal remains included predominantly lagomorphs (jackrabbits and cottontails) and artiodactyls (deer, pronghorn, and bighorn sheep). Only one beaver bone was identified. Mule deer (*Odocoileus hemionus*) dominates the assemblage with 223 bones with the greatest number of bones being found in levels 4 to 7 (of 9 total levels excavated). Cottontails (*Sylvilagus sp.*) are the next most numerous species with a total of 80 bones identified and also being most prominent in levels 4 to 7. All other species number below 10. Both the mule deer and the cottontail are indicative of a pinon-juniper environment due to their habitat preferences (Thomas 2013).

While not within the region of 42UN8049 and 42UN8053, the Karlo Site in northeastern California provides a contrast to the many cave sites that were studied in the twentieth century. Karlo was one of the first open air archaeological sites to be excavated and is one of the most prolific with regard to assemblage size (Riddell 1960; Thomas 2013). Thousands of artifacts were collected during the 1955 excavation of the site and include over 600 projectile points,

1200 animal bone fragments, eight scapula bone tools, and hundreds of other artifacts. Prior to Riddell's excavation only cave sites had yielded diagnostic artifacts in quantity and the Karlo Site represents the extent of occupation of a Great Basin site as it contains artifacts associated with the Middle and Late Archaic. While many artifacts were present at the site, it is still thought that Karlo was occupied only as a central place over the winter months. The quantity of artifacts over time is attributed to an increase in the duration of time people spent at the site due to environmental change and the notable pattern of small family groups to aggregate at winter camps (Thomas 2013).

The purpose of discussing Karlo is to draw a distinction between a site that was regularly occupied through time and a relatively ephemeral Great Basin sites. Other open-air archaeological sites around Karlo were used en route to other resources or as sites that provided a good location for acquiring winter resources, according to ethnographic information (Thomas 2013). It is possible that 42UN8049 and 42UN8053 represent a periphery site to a central place or upland foraging area.

Research Questions

Given the cultural materials and context of 42UN8049 and 42UN8053, this proposal recommends two broad research questions for the data recovery. 1) To what extent were the conglomerate deposits at 42UN8049 used for stone tool production, versus natural fracture of rock exposed on the site surface? Quarry sites are rarely found in the Great Basin and Bishop conglomerate is a ubiquitously available resource in the Uintah Basin. The question seeks to understand the use of the conglomerate material as a tool stone resource. If the site was used as a quarry, the expectation would be to see all stages of lithic reduction and informal tools as is noted in the surface assemblage for 42UN8049. 2) The review of regional archaeological literature provides a context for subsistence patterns that reflect a flexible and largely mobile subsistence strategy among the prehistoric occupants of the region. Was this site used opportunistically as a quarry and as a temporary camp on the way to procure upland resources? If the site was used en route to upland resources the expectation would be to see less varied cultural material that what is generally found at more permanently occupied sites (i.e. bone, formal tools, grinding tools, etc.).

The first broad question is the degree to which the sites represent the remains of past human activity or natural processes. This question is particularly relevant for 42UN8049, the quarry, where DWE said some debitage may be natural, not cultural, in origin. If the site represents the remains of past lithic raw material procurement, we would expect to find some artifacts of imported raw material, particularly tools with evidence of re-sharpening to a degree that they had little use life remaining. We would also expect to find lithic artifacts of local raw material representing a broad range of sizes and reduction stages, possibly including microdebitage and/or pressure flakes. We would also expect high variability in lithic artifact density across the surface, not an evenly distributed haze of flakes, cores, tools. Finally, rocks can be broken in several ways that produce materials resembling the results of stone tool production, including frost, glacial transportation, cryoturbation, heavy machinery, and hoofed animals (Manninen 2007:79). Analysis comparing natural and cultural assemblages indicates that several attributes

are useful in distinguishing culturally and naturally modified stone, including platform preparation, bifacially flaked artifacts, clear bulbs of percussion, small amounts of cortex, clear arises, and large numbers of flake removals (Gillespie et al. 2004). Lithic artifacts collected from 42UN8049 will be analyzed to see if they better fit the patterning in natural or cultural fractured rock assemblages. It is likely that the site represents a mix of naturally and culturally fractured stone, but areas in which human stone tool manufacture predominated may be identifiable in the surface assemblage.

The second broad set of research questions involves how the two sites are related to broad patterns in Great Basin prehistory, specifically the practice of seasonal rounds for resource exploitation.

- Are the two sites part of transhumance where raw materials were used opportunistically or were they specifically used as destinations for resource procurement?
    - Were exhausted tools of imported stone discarded at the sites? If yes, it suggests the sites were associated with transhumance patterns.
    - Does the quarry assemblage contain all stages of tool production? If tools were made and used at the site, it suggests the site was part of food resource extraction. If the site was used to make tools that were then transported elsewhere, it would suggest the quarry was a specific destination en route to uplands or lowlands food resource areas.
    - Are there multiple occupations? Indications of repeated use over long periods would suggest the quarry was a destination for stone procurement.
- Are the two sites along natural pathways to uplands where hunted resources were available? Are they along pathways linking other previously recorded sites in nearby upland and lowland locations?

Field Methods

At site 42UN8049, HDR will record all artifacts and conduct shallow shovel scrapes of 1 percent of the area in Concentration 1 (which measures roughly 600 m^2) and in Concentration 2 (which measures approximately 4000 m^2). In Concentration 1, HDR will place a grid measuring 3 m x 2 m (and totaling 6 m^2). In Concentration 2, HDR will place a grid measuring 5 x 8 m (and totaling 40 m^2). In each grid, HDR will collect all surface artifacts by grid number. HDR will then excavate all units in 5 cm arbitrary levels and screen all sediment through 1/8-inch screen. Artifacts will be bagged by grid number and depth.

In addition, HDR will place two 20 m long trenches outside of the concentrations. After collecting surface artifacts, in 1x1 m grid units, the trenches will be mechanically excavated to bedrock. The exposed sediment profiles will be examined for natural stratigraphic profiles, subsurface cultural features and occupation surfaces, and indications of profile formation processes. Particular attention will be paid to characteristics that allow comparison of the profiles with natural soil profiles recorded for the Bishop conglomerate formation.

At 42UN8053, HDR will first photograph and map the fire-cracked rock concentration as it appears from the surface. HDR will then place two 1x1 m test units in the comparatively buried half of the feature to recover approximately one half of the fire-cracked rock concentration. The

unit will be excavated to bedrock of culturally sterile sediment, whichever is reached first. All sediment will be screened through 1/8-inch screen. All artifacts will be collected for laboratory analysis, and their depth and other provenience information will be recorded in the field. Any intact features or chronologically diagnostic artifacts observed in-situ during excavation will be photographed and mapped. Careful attention will be paid to small faunal remains, charcoal, and other cultural materials that can be further analyzed.

At both sites, HDR will also reexamine the surface assemblage for chronologically diagnostic artifacts and formal tools. These artifacts will be point provenienced using sub-meter accurate GPS and collected for later analysis.

Laboratory Methods

Given the shallow sediments at the sties, we do not anticipate that special studies of archaeological materials will be possible. Such studies, including analysis of macrobotanical remains, radiometric dating, or analysis of faunal materials, require well-preserved materials from subsurface contexts. Analysis will instead focus on lithic artifact analysis.

Analysis will use a careful definition of interior etc. flakes to ensure replicability across multiple analysts.

Table 1. Definition of lithic debitage classes.

Term	Description
Primary Flake	Cortical flake detached using percussion during initial core reduction.
Secondary Flake	Flake detached using percussion during core reduction with some cortex, generally lacking platform preparation.
Interior Flake	Percussion produced flake without cortex that generally exhibits an unprepared or single faceted platform.
Flake Fragment	Flake missing a striking platform.
Early-Stage Biface Thinning Flake	Percussion flakes removed during biface reduction. These flakes exhibit few flake scars on the exterior surface, are generally curved in longitudinal cross section and exhibit prepared platforms.
Late-Stage Biface Thinning Flake	Flakes removed during the latter stage of percussion biface production. These flakes have multiple flake scars on the exterior surfaces, are generally flat in longitudinal cross-section, and exhibit well prepared platforms.
Pressure Flake	Flakes produced during the final stage in the reduction process using a pressure flake tool. These flakes are generally slightly skewed in long section, often exhibit a single axis, and have multifaceted or abraded platforms.
Bipolar Flake	Percussion produced flake exhibiting crushed or shattered platforms on each end. The flakes are angular to wedge-shaped in cross-section with parallel sided flake scars. Bipolar flakes with cortex are defined as Stage 1. Bipolar flakes without cortex are defined as Stage 2.
Angular debris	Debitage from reduction lacking any flake morphological characteristics.

The data recovery project will also use GIS analysis of the two sites, especially the quarry, to evaluate their relationships to other prehistoric sites in the area, to natural pathways to upland areas, and to areas that likely contained important prehistoric food resources.

Geochemical analysis aimed at determining the source of the chert at the site is probably not useful, as the chert in the local bedrock is from conglomerate material with potentially very diverse origins. However, it may be possible to coarsely identify different types of chert in the assemblage based on color and other visual characteristics.

Fire-cracked rock recovered from 42UN8053 will be analyzed for material and weighed, and the assemblage will be compared to other prehistoric hearth features observed at other sites in the Uintah Basin.

As the sites to be excavated are located on private land belonging to Simplot, HDR will facilitate professional curation of all artifacts collected during the excavations. Such efforts may require transfer of ownership documentation. HDR has a standing curation agreement with the Utah Museum of Natural History.

Report Preparation

Results of the excavations and research will be presented in a professional quality report. At a minimum, the report will include:

I. Report Cover Page
II. Abstract
III. Table of Contents
IV. Undertaking/Project Description
V. Environmental Setting
VI. Research Questions and Theoretical Discussion
VII. Field Methodology
VIII. Results
IX. Discussion
X. Conclusions/Summary
XI. References Cited
XII. Attachments (as appropriate)

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A great deal of research focusing on subsistence has been conducted in the Great Basin (Barlow 2002; Bayham et al. 2011; Bowen 2006; Broughton et al. 2011; Broughton and Grayson 2011; Byers et al. 2004; Byers and Broughton 2004; Byers et al. 2005; Carpenter 2000; Grayson 1977; Grayson 1993; Grayson 2000; Grayson and Cannon 1999; Zeenah 2004). Research that has focused on subsistence near the Uintah Basin includes Day's (1964) discussion of Thorne Cave, the Byers et al. (2004) discussion of artiodactyl populations in the Holocene, and Lupo and Schmidt's discussion of bison hunting during the Holocene in eastern Utah. Byers et al. (2004) discuss the paleoenvironment of southwestern Wyoming and focus particularly on the variation of precipitation in the region and its effects on artiodactyl populations. In their study of

the recent archaeological materials that have been excavated from areas where oil and gas fields are being constructed, they compared them with the archaofaunal record from the region, a noted increase in artiodactyl densities is notable during the late Holocene in the Wyoming Basin. Lupo and Schmidt (1997) discussed the availability of bison in the late Holocene and find that the variability in bison fluctuated and may have contributed to flexibility in Freemont subsistence strategies in northeastern Utah.

The Uintah Basin is bounded by the Wasatch Mountains along the west, the Uintah range on the north, the Rocky Mountain range on the east, and the Book Cliffs on the south. The Green River is the major tributary that runs through the region and it flows through Flaming Gorge fault south to the Colorado River (Day 1964). Geologically, the Uinta Basin, as with many basins in the Great Basin, fluctuated between being a lacustrine lake environment and a saline lake environment during the Cretaceous and Tertiary periods. Carroll and Bohacs (2001) note three lacustrine facies that contribute to the petroleum sources in the Uintah Basin: fluvial deposits that contributed to the development of mudstone; basin fills that raised the grade of the stream beds (aggredational processes) and valleys and were also subject to processes that spread the fill over the basin (pregradational processes); and aggraded non-marine fill deposits that desiccated during times when the environment was more saline.

The Uinta Mountains are formed of sedimentary rock that uplifted during the Cretaceous period and contain large faults. The red and purple quartzite and sandstone beds aggregate more than 12,000 feet in thickness and form the mass of the mountain range. During the Tertiary the Green River filled with sediment up to thousands of feet; a phenomenon mentioned in the report of Thorne Cave and its depositional history of Cliff Creek (Day 1964).

Bishop conglomerate is noted to be the dominate formation exposed at the site locations and is thought to be the primary source of tool stone at the project area. When recording the two sites, DWE described the clasts at 42UN8049 as including chert and chalcedony cobbles mostly in the 5 to 10 cm (2 to 4 inch) diameter range, making them large enough to serve as raw material for stone tool manufacture. The depositional date of the conglomerate is unknown, but it is found mostly to "mantle the highest flat-topped inter-stream divides" in the Uintah Basin, such as the landform where 42UN8049 and 42UN8053 are located. Both sites are on a narrow ridge on which sediments are subject to alluvial erosion and redeposition into the adjacent Cottonwood and Buckhorn canyons.

Research conducted by Dehler et al. (2005) on ash layers within the Uinta Basin agree that the depositional history of Bishop conglomerate is poorly understood, in part because of its lack of exposure and in part because of inadequate study. They note that the Starr Flat member of the Duchesne River may be a facies of the Bishop conglomerate and ash lenses date to 30 to 37 million years ago, and suggest a deposition date for the conglomerate.

The deposition of Bishop conglomerate is thought to have occurred during a moist climatic period in the late Miocene or early Pliocene and was deposited during an uplifting even in the Uinta Mountains (Baker, Dane, and Reeside, Jr. 1936: 167- 168). Bishop conglomerate is described as poorly sorted veneer overlying the Brown's Park formation, and is one that doesn't conceal the shape of the underlying landforms however the erosion of the conglomerate does conceal the surfaces of some landforms (Baker, Dane, and Reeside, Jr. 1936: 171-172).

The conglomerate is described as "reddish brown boulders derived from the Uintah Mountain group" and is composed of red quartzite, white quartzite, red sandstone, white quartz and hornblende schists, limestone with a chert-like quality, and black and red chert. The combination of stone types varies by location and consists of gravels, pebbles, cobbles, and boulders laid in a medium to coarse-grained sand matrix. Below the timberline the conglomerate is covered by a light coating of sandy soil. Above the timberline there is greater solid deposition over the conglomerate (Baker, Dane, and Reeside, Jr. 1936: 172-173).

Given the basin's unique geographic location; Great Basin, Plains, Fremont, and Puebloan cultures influenced the region (Aikens 1964; Day 1964). One of the oldest known sites in the Uintah Basin is Thorne Cave which is located on an ephemeral tributary of the Green River named Cliff Creek. Cultural deposits noted at the cave included animal bone (deer, cottontail, pronghorn, and beaver), charcoal, concentrations of ash, fire cracked rock, manos (complete and fragmented), a grinding stone, quartz flakes and other stone tool material, a bone awl, a bone needle, a bone pendant, a scapula saw/scraper (similar to one found at Lovelock Cave), baked clay objects, a lanceolate projectile point and a lanceolate blade, six stemmed projectile points, scrapers (of both stone and bone), and an imprint of a twine basket left in the clay floor of the cave (Day1964: 52-53).

The accumulation of artifacts lacked provenience due to water and the deposition of soils within the cave after it was used, however the assemblage indicates tools and materials commonly associated with the Archaic period in the Great Basin and compares with other caves and sites in the Great Basin that do have more well preserved and datable deposits (Hells Midden [Lister 1951], Humbolt Cave [Heizer and Krieger 1956], Love Lock Cave [Loud and Harrington 1965], the Karlo Site [Riddell 1960]). Radiocarbon samples taken from the site date the charcoal to around 2000 BC (4230-4170 B.P.). Day (1964: 59) notes that some of the artifacts may have been of a high plains influence, suggesting that more than Great Basin culture groups may have used the cave.

The seven projectile points (complete and partial) recovered at Thorne cave ranged in length from 5.5 to 3.2 cm and were made out of cryptocrystalline silicate materials (agate, chert, and chalcedony) of various colors. All of the points showed retouch and some had secondary flake removal (Day 1964: 54-55)

The faunal remains included predominantly lagomorphs (jackrabbits and cottontails) and artiodactyls (deer, pronghorn, and bighorn sheep). Only one beaver bone was identified. Mule deer (*Odocoileus hemionus*) dominates the assemblage with 223 bones with the greatest number of bones being found in levels 4 to 7 (of 9 total levels excavated). Cottontails (*Sylvilagus sp.*) are the next most numerous species with a total of 80 bones identified and also being most prominent in levels 4 to 7. All other species number below 10. Both the mule deer and the cottontail are indicative of a pinon-juniper environment due to their habitat preferences (Thomas 2013).

While not within the region of 42UN8049 and 42UN8053, the Karlo Site in northeastern California provides a contrast to the many cave sites that were studied in the twentieth century. Karlo was one of the first open air archaeological sites to be excavated and is one of the most prolific with regard to assemblage size (Riddell 1960; Thomas 2013). Thousands of artifacts were collected during the 1955 excavation of the site and include over 600 projectile points,

1200 animal bone fragments, eight scapula bone tools, and hundreds of other artifacts. Prior to Riddell's excavation only cave sites had yielded diagnostic artifacts in quantity and the Karlo Site represents the extent of occupation of a Great Basin site as it contains artifacts associated with the Middle and Late Archaic. While many artifacts were present at the site, it is still thought that Karlo was occupied only as a central place over the winter months. The quantity of artifacts over time is attributed to an increase in the duration of time people spent at the site due to environmental change and the notable pattern of small family groups to aggregate at winter camps (Thomas 2013).

The purpose of discussing Karlo is to draw a distinction between a site that was regularly occupied through time and a relatively ephemeral Great Basin sites. Other open-air archaeological sites around Karlo were used en route to other resources or as sites that provided a good location for acquiring winter resources, according to ethnographic information (Thomas 2013). It is possible that 42UN8049 and 42UN8053 represent a periphery site to a central place or upland foraging area.

Research Questions

Given the cultural materials and context of 42UN8049 and 42UN8053, this proposal recommends two broad research questions for the data recovery. 1) To what extent were the conglomerate deposits at 42UN8049 used for stone tool production, versus natural fracture of rock exposed on the site surface? Quarry sites are rarely found in the Great Basin and Bishop conglomerate is a ubiquitously available resource in the Uintah Basin. The question seeks to understand the use of the conglomerate material as a tool stone resource. If the site was used as a quarry, the expectation would be to see all stages of lithic reduction and informal tools as is noted in the surface assemblage for 42UN8049. 2) The review of regional archaeological literature provides a context for subsistence patterns that reflect a flexible and largely mobile subsistence strategy among the prehistoric occupants of the region. Was this site used opportunistically as a quarry and as a temporary camp on the way to procure upland resources? If the site was used en route to upland resources the expectation would be to see less varied cultural material that what is generally found at more permanently occupied sites (i.e. bone, formal tools, grinding tools, etc.).

The first broad question is the degree to which the sites represent the remains of past human activity or natural processes. This question is particularly relevant for 42UN8049, the quarry, where DWE said some debitage may be natural, not cultural, in origin. If the site represents the remains of past lithic raw material procurement, we would expect to find some artifacts of imported raw material, particularly tools with evidence of re-sharpening to a degree that they had little use life remaining. We would also expect to find lithic artifacts of local raw material representing a broad range of sizes and reduction stages, possibly including microdebitage and/or pressure flakes. We would also expect high variability in lithic artifact density across the surface, not an evenly distributed haze of flakes, cores, tools. Finally, rocks can be broken in several ways that produce materials resembling the results of stone tool production, including frost, glacial transportation, cryoturbation, heavy machinery, and hoofed animals (Manninen 2007:79). Analysis comparing natural and cultural assemblages indicates that several attributes

are useful in distinguishing culturally and naturally modified stone, including platform preparation, bifacially flaked artifacts, clear bulbs of percussion, small amounts of cortex, clear arises, and large numbers of flake removals (Gillespie et al. 2004). Lithic artifacts collected from 42UN8049 will be analyzed to see if they better fit the patterning in natural or cultural fractured rock assemblages. It is likely that the site represents a mix of naturally and culturally fractured stone, but areas in which human stone tool manufacture predominated may be identifiable in the surface assemblage.

The second broad set of research questions involves how the two sites are related to broad patterns in Great Basin prehistory, specifically the practice of seasonal rounds for resource exploitation.

- Are the two sites part of transhumance where raw materials were used opportunistically or were they specifically used as destinations for resource procurement?
    - Were exhausted tools of imported stone discarded at the sites? If yes, it suggests the sites were associated with transhumance patterns.
    - Does the quarry assemblage contain all stages of tool production? If tools were made and used at the site, it suggests the site was part of food resource extraction. If the site was used to make tools that were then transported elsewhere, it would suggest the quarry was a specific destination en route to uplands or lowlands food resource areas.
    - Are there multiple occupations? Indications of repeated use over long periods would suggest the quarry was a destination for stone procurement.
- Are the two sites along natural pathways to uplands where hunted resources were available? Are they along pathways linking other previously recorded sites in nearby upland and lowland locations?

Field Methods

At site 42UN8049, HDR will record all artifacts and conduct shallow shovel scrapes of 1 percent of the area in Concentration 1 (which measures roughly 600 m^2) and in Concentration 2 (which measures approximately 4000 m^2). In Concentration 1, HDR will place a grid measuring 3 m x 2 m (and totaling 6 m^2). In Concentration 2, HDR will place a grid measuring 5 x 8 m (and totaling 40 m^2). In each grid, HDR will collect all surface artifacts by grid number. HDR will then excavate all units in 5 cm arbitrary levels and screen all sediment through 1/8-inch screen. Artifacts will be bagged by grid number and depth.

In addition, HDR will place two 20 m long trenches outside of the concentrations. After collecting surface artifacts, in 1x1 m grid units, the trenches will be mechanically excavated to bedrock. The exposed sediment profiles will be examined for natural stratigraphic profiles, subsurface cultural features and occupation surfaces, and indications of profile formation processes. Particular attention will be paid to characteristics that allow comparison of the profiles with natural soil profiles recorded for the Bishop conglomerate formation.

At 42UN8053, HDR will first photograph and map the fire-cracked rock concentration as it appears from the surface. HDR will then place two 1x1 m test units in the comparatively buried half of the feature to recover approximately one half of the fire-cracked rock concentration. The

unit will be excavated to bedrock of culturally sterile sediment, whichever is reached first. All sediment will be screened through 1/8-inch screen. All artifacts will be collected for laboratory analysis, and their depth and other provenience information will be recorded in the field. Any intact features or chronologically diagnostic artifacts observed in-situ during excavation will be photographed and mapped. Careful attention will be paid to small faunal remains, charcoal, and other cultural materials that can be further analyzed.

At both sites, HDR will also reexamine the surface assemblage for chronologically diagnostic artifacts and formal tools. These artifacts will be point provenienced using sub-meter accurate GPS and collected for later analysis.

Laboratory Methods

Given the shallow sediments at the sties, we do not anticipate that special studies of archaeological materials will be possible. Such studies, including analysis of macrobotanical remains, radiometric dating, or analysis of faunal materials, require well-preserved materials from subsurface contexts. Analysis will instead focus on lithic artifact analysis.

Analysis will use a careful definition of interior etc. flakes to ensure replicability across multiple analysts.

Table 1. Definition of lithic debitage classes.

Term	Description
Primary Flake	Cortical flake detached using percussion during initial core reduction.
Secondary Flake	Flake detached using percussion during core reduction with some cortex, generally lacking platform preparation.
Interior Flake	Percussion produced flake without cortex that generally exhibits an unprepared or single faceted platform.
Flake Fragment	Flake missing a striking platform.
Early-Stage Biface Thinning Flake	Percussion flakes removed during biface reduction. These flakes exhibit few flake scars on the exterior surface, are generally curved in longitudinal cross section and exhibit prepared platforms.
Late-Stage Biface Thinning Flake	Flakes removed during the latter stage of percussion biface production. These flakes have multiple flake scars on the exterior surfaces, are generally flat in longitudinal cross-section, and exhibit well prepared platforms.
Pressure Flake	Flakes produced during the final stage in the reduction process using a pressure flake tool. These flakes are generally slightly skewed in long section, often exhibit a single axis, and have multifaceted or abraded platforms.
Bipolar Flake	Percussion produced flake exhibiting crushed or shattered platforms on each end. The flakes are angular to wedge-shaped in cross-section with parallel sided flake scars. Bipolar flakes with cortex are defined as Stage 1. Bipolar flakes without cortex are defined as Stage 2.
Angular debris	Debitage from reduction lacking any flake morphological characteristics.

The data recovery project will also use GIS analysis of the two sites, especially the quarry, to evaluate their relationships to other prehistoric sites in the area, to natural pathways to upland areas, and to areas that likely contained important prehistoric food resources.

Geochemical analysis aimed at determining the source of the chert at the site is probably not useful, as the chert in the local bedrock is from conglomerate material with potentially very diverse origins. However, it may be possible to coarsely identify different types of chert in the assemblage based on color and other visual characteristics.

Fire-cracked rock recovered from 42UN8053 will be analyzed for material and weighed, and the assemblage will be compared to other prehistoric hearth features observed at other sites in the Uintah Basin.

As the sites to be excavated are located on private land belonging to Simplot, HDR will facilitate professional curation of all artifacts collected during the excavations. Such efforts may require transfer of ownership documentation. HDR has a standing curation agreement with the Utah Museum of Natural History.

Report Preparation

Results of the excavations and research will be presented in a professional quality report. At a minimum, the report will include:

I. Report Cover Page
II. Abstract
III. Table of Contents
IV. Undertaking/Project Description
V. Environmental Setting
VI. Research Questions and Theoretical Discussion
VII. Field Methodology
VIII. Results
IX. Discussion
X. Conclusions/Summary
XI. References Cited
XII. Attachments (as appropriate)

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